Assessment of the economic performance of the seabream and seabass aquaculture industry in the European Union

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Abstract

Production of gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*) is the second most important aquaculture industry in the European Union. During the last 10 years, the industry has experienced a process of industry concentration with the aim to overcome efficiency and profitability issues. However, the economic performance of the companies is still in general rather poor. The present work analyzes the economic performance of EU seabream and seabass companies in the period 2008-2016. The work is the first study to analyze companies' profitability in the EU as a whole, by country and company size, using economic and financial data extracted from companies' annual accounts. Based on the results, the study discusses the improvement of production and business profitability in recent years and the different factors that may have caused it, as well as the challenges and threats that seabream and seabass companies will have to face in order to achieve economic sustainability.

Keywords: Economic performance; Aquaculture; European Union; Seabream; Seabass; Profitability.

1. Introduction

Gilthead seabream (*Sparus aurata*) and European seabass (*Dicentrarchus labrax*) are the most important aquaculture species in the Mediterranean and rank second in the European Union (EU) aquaculture sector in value terms, after Atlantic salmon (STECF, 2018). Intensive production of seabream and seabass began in the late 1980s, and grew exponentially during the 1990s. After the turn of the century, the industry suffered the consequences of a high growth in supply without being able to expand the market demand, which led to a successive drops in the market price (Figure 1). As a consequence, many companies were put out of business while others started a process of business mergers in order to achieve economies of scale and scope (Rad & Köksal, 2000; Rad, 2007; Wagner & Young, 2009; STECF, 2014).

The investment efforts in research and innovation made by governments and private companies in recent years have generated positive developments in production, processing, logistics and marketing that are expected to help industry profitability through demand generation and cost savings (GLOBEFISH, 2017a). Despite these improvements, non-EU producers appear to have competitive advantages (e.g. lower labor cost, or licencing of new production facilities) which, at an uneven playing field, make the cost of production in the EU countries higher than in third countries such as Turkey (STECF, 2016, 2018; Koçak and Tatlidil, 2004; Bozoglu and Ceyhan, 2009; Arikan and Aral 2019).

In the EU's Blue Growth Strategy aquaculture has been identified as one of the sectors with a high potential for creating sustainable jobs and growth (European Commission, 2012). Thus, within the EU, this sector is considered as a key economic activity with a large potential to increase seafood sustainable production, and improve incomes and employment in coastal and rural areas. Given the increasing importance of aquaculture for policy makers within the EU, the demand for analysis about the evolution of the economic performance of the industry is higher than ever (Guillen et al., 2015).

The profitability of the EU aquaculture sector has been estimated in economic reports published by the European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF, 2014; STECF, 2016; STECF, 2018) based on information from the Data Collection Framework (DCF) and more recently, from the EU multi-annual program (EU-MAP). In addition to STECF, Guillen et al. (2015) assessed the economic performance of the EU aquaculture sector by country and segment for the years 2009, 2010, and 2011 using economic and financial data extracted from the Amadeus database[1]. These authors were the first to call attention to the lack of studies in this field despite its importance within the maritime, economic and social policies of the EU. Guillen et al. (2015) used financial and accounting data of aquaculture companies. The use of company data does not substitute the assessments for the EU by the STECF, but they are a useful complement providing more detailed insights. While STECF reports analyze the economic performance obtained by the aquaculture activity, the analyses at company level inform about factors influencing the economic sustainability of the companies which actually produce the fish (Guillen et al., 2015).

In the case of the seabream and seabass industry, several studies on technical efficiency, productivity and profitability have been conducted at the company level in Greece (Karagiannis et al., 2000a; Karagiannis et al., 2000b; Karagiannis et al., 2002; Pantzios et al., 2011), in Spain (Sotorrío, 2002; Llorente and Luna, 2012) and Italy (Trapani et al., 2014). The national approach of these studies makes it difficult to compare the results between countries due to the different methodologies and sources of data used. In addition, most of the studies are relatively old, some

1 Amadeus is a database managed by Bureau van Dijk that contains company-level accounting data across Europe. The database includes companies' financial accounts (balance sheets and profit and loss account), legal form, and classifications according to industry activity codes.

almost 20 years, and the challenges facing the industry has changed significantly after the turn of the century.

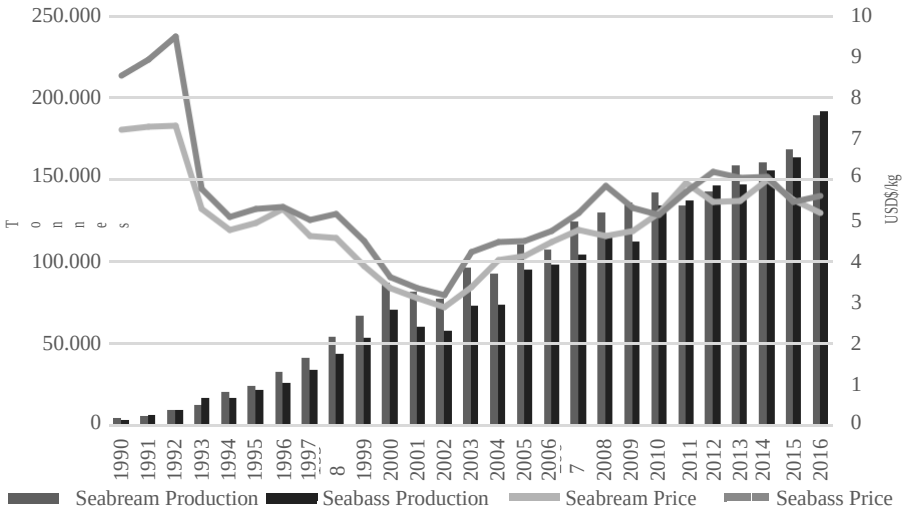
The economic reports produced by STECF in recent years contain specific analyses on seabream and seabass aquaculture considering an EU approach. However, the use of aggregated data limits the possibility of expanding the analysis to the company level. This approach limits the possibilities to give advice to policy makers working on implementing policies to promote the efficiency and competitiveness of seabream and seabass at a more disaggregated level. In order to try to give a more detailed picture of the industry performance this paper analyses the economic development of the EU seabream and seabass industry by country and company size in the period 2008-2016 using economic and financial data extracted from companies´ annual accounts. The work constitutes a novel contribution since it is the first study to analyze seabream and seabass companies' profitability in the EU as a whole.

The paper is structured as follows. First, an overview of the recent evolution and present situation of the seabream and seabass industry and markets is provided. Secondly, the materials and methods section describes the sources of information, the data collection process, and the economic performance indicators considered in the analyses. Then, in the results section, the EU seabream and seabass industry profitability evolution is presented. Finally, a discussion and conclusions section are provided relating the results obtained at company level with the evolution and latest developments on production and markets throughout the Mediterranean.

2. Overview of the seabream and seabass industry and markets

The production of farmed seabream and seabass was 376,984 tonnes valued at 2,066 million USD in 2016[2]. The capture sector is relatively unimportant for these species as it represented less than 4% of total volumes, and the catches are mostly found to compete in a separate market (Bjørndal and Guillen, 2017; Regnier and Bayramoglu, 2017; Bayramoglu, 2019). About 95% of the production is located in the Mediterranean. Turkey and Greece are the leading producers covering 35% and 25% of the total production value, respectively. The five largest producing countries (Turkey, Greece, Egypt, Spain, and Tunisia) covered more than 88% of the total volumes in 2016 (FAO, 2018).

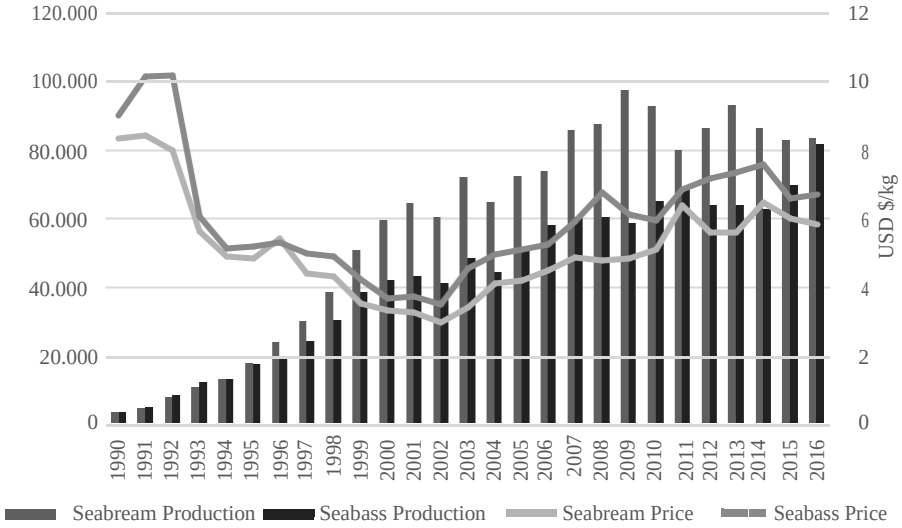
Figure 1. Gilthead seabream and European seabass aquaculture production and price (real price) (1990-2016). FAO (2018).



2 According to the European Central Bank, the exchange rate between EUR and USD in 2016 was 1 EUR for 1.1069 USD.

Seabass aquaculture production was 191 thousand tonnes valued at 1,089 million USD in 2016, while seabream production was 186 thousand tonnes valued at 977 million USD. Turkey is leading in seabass production and Greece is the largest seabream producer. Since 2011, there has been an increase in the quantities produced (Figure 1) (FAO, 2018).

Figure 2. Gilthead seabream and European seabass aquaculture production and price (real price) (1990-2016) in the European Union. FAO (2018).



The EU member states produced 82 thousand tonnes of seabass, valued 555 million USD and 83 thousand tonnes of seabream valued 493 million USD in 2016. While the EU countries still makes up about one half of the total production of both species the share is declining and in recent years the countries of the EU have lost the leadership of the industry. Since 2012, Turkey has replaced Greece as the leading producer country for seabream and seabass (FAO, 2018). The production of seabream and seabass has been stagnated in traditional producers such as France, Italy or Spain; meanwhile the industry is in full expansion in third countries. Despite this context, the EU still maintain half of the value produced by the industry and during 2015 and 2016 the quantities produced have increased significantly again.

Table 1. Gilthead seabream and European seabass apparent consumption by country in 2016. (Aquaculture + captures+ imports – exports). Source: FAO (2018)

Seabream		**Seabass**	
Country	**Tonnes**	**Country**	**Tonnes**
Italy	32,224	Turkey	54,415
Egypt	27,579	Italy	30,411
Turkey	17,124	Egypt	24,812
Spain	16,460	Spain	24,076
Tunisia	15,890	France	9,934
Portugal	11,518	Greece	8,491
France	10,682	Portugal	7,288
Greece	10,069	UK	6,359

Production and trade data show that seabream and seabass production and consumption is mainly taking place in Mediterranean countries. The main markets for seabream and seabass are Turkey, Italy, Egypt, Spain and France (Table 1). There are clearly differentiated markets that are primarily supplied with domestic production (Turkey, Egypt, Greece and Tunisia) and those that are increasingly dependent on imports (Italy, Spain, France and Portugal). Trade takes place mainly from the major producing countries (Greece and Turkey) to the principal markets in Southern Europe where in recent years production has been stagnated, and an increasing part of the demand is met with imports. The increase of production in countries such as Egypt or Tunisia does not seem to have a major impact on the European markets and trade relations among the rest

of the producers, given that most of their production goes to the domestic market (Bjørndal and Guillen, 2018). Turkey also export to Russia (banned for EU products since 2014 due to trade embargo) where approximately 10% of the exports are directed (Turkstat, 2017) and other nearby Mediterranean markets such as Lebanon.

3. Materials and methods

The approach used in this study is adopted from Guillen et al (2015), who used company-level accounting data from 28 European countries to obtain several profitability indicators to assess the economic performance of the EU aquaculture sector. In this study only those companies whose main activity is the cultivation of seabream and/or seabass are considered.[3] The analysis is performed for the EU industry as a whole, by country and company size.

3.1. Data

The main source of information in this study is the Orbis database managed by Bureau van Dijk (2018). Orbis covers company-level accounting data worldwide in a standardized format. The database includes companies' financial accounts (balance sheets and profit and loss account), legal form, and classifications according to industry activity codes for 300 million companies around the world. In Europe, information is obtained mainly from public balance declarations. Table 2 shows the number of companies by country and year.

Table 2. Number of seabream and seabass companies by country and year

Country	Orbis	SB&SB	2008	2009	2010	2011	2012	2013	2014	2015	2016
Croatia	26	5	3	3	3	3	3	3	4	4	4
Cyprus	6	5 (1)	1	3	3	2	3	3	4	4	3
France	221	15 (5)	7	5	5	8	5	5	7	7	5
Greece	115	43 (5)	36	37	37	37	37	36	36	31	24
Italy	147	19	13	16	16	17	16	18	18	16	16
Portugal	20	1	1	1	1	1	1	1	1	1	1
Slovenia	5	3	2	2	2	3	3	3	2	1	1
Spain	143	55 (7)	42	43	40	40	38	37	28	29	23
Total	685	146	105	110	107	111	106	106	100	93	77

Note: (Orbis) Total aquaculture companies listed in the Nace Rev 2: A32; (SB&SB) companies farming mainly seabream/seabass, companies without financial information appear in brackets.

The NACE Rev 2 code A32[4] was used to select the companies having aquaculture as their main economic activity in the following countries: Croatia, Cyprus, France, Greece, Italy, Malta, Portugal, Slovenia and Spain. The companies were pre-selected when the words seabass/seabream were included in the narrative description of the activity, the commercial description in the original language, or the products and services list. Even when the description of the activity details seabass/seabream farming, a specific search online was made to ensure that the company farms seabass/seabream. All this process results in the identification of a total of 146 companies farming mainly seabass/seabream at some point between 2008 and 2016 (Table 2). The final sample of seabass/seabream of companies is composed by 128 companies with financial information. This number of companies is not homogeneous throughout the considered period 2008-2016 and not all of them provide information all the years (Table 2).

In this study the criteria of the Orbis database is used to classify companies according to their size. Orbis labels companies as very large companies when the annual turnover is higher than

[3] The main activity of a company is the activity (aquaculture in this case) which contributes most to the total value added of that unit, and does not necessarily account for 50% or more of the unit's total value added.

[4] NACE Rev.2 is the Statistical classification of economic activities in the European Community. Section A contains the economic activities related to agriculture, forestry and fishing. Group 03.2 corresponds to "Aquaculture", i.e. the production process involving the culturing or farming (including harvesting) of aquatic organisms (fish, molluscs, crustaceans, plants, crocodiles, alligators and amphibians).

€100 million, total assets are higher than €200 million, or the number of employees is higher than 1,000. Large companies are those with an annual turnover higher than €10 million, total assets higher than €20 million, or more than 150 employees. Medium-sized companies[5] are those with a volume of sales higher than €1 million, total assets higher than €2 million, or more than 15 employees. Orbis labels small companies as those not fulfilling the previous criteria (Cidad et al., 2018). Table 3 shows the number of companies by size and by year.

Table 3. Number of seabream and seabass companies by size and year

Company size	2008	2009	2010	2011	2012	2013	2014	2015	2016
Very large	5	5	5	5	5	5	5	4	4
Large	24	27	26	28	27	27	25	26	23
Medium-sized	76	78	76	78	74	74	70	63	50
Total	105	110	107	111	106	106	100	93	77

Table 4 provides a description of the structure of the seabream and seabass companies included in the analysis. The variables used to characterize all the companies are the same variables that Orbis uses to segment by size, that is, total assets, number of employees and turnover.

Table 4. Structure indicators (companies' average) for the 128 seabream and seabass companies at aggregated, size and country level. Source: Authors from data obtained in ORBIS.

		2008	2009	2010	2011	2012	2013	2014	2015	2016
	Total assets (th EUR)	20,799	20,300	21,361	20,697	20,987	19,395	19,033	20,212	23,677
	Nº of employees	62	65	65	60	64	57	60	60	74
	Turnover (th EUR)	8,598	8,801	8,709	9,123	11,267	13,008	14,447	17,059	19,735
	Total assets (th EUR)	227,376	215,955	216,119	194,580	195,819	163,372	162,889	183,480	205,734
	Nº of employees	848	658	653	621	751	606	595	649	822
	Turnover (th EUR)	77,951	77,126	53,825	49,648	90,207	126,719	150,660	210,350	212,551
	Total assets (th EUR)	30,405	30,734	32,528	31,866	32,084	31,916	30,080	31,596	32,297
	Nº of employees	68	83	91	88	84	83	93	90	92
	Turnover (th EUR)	12,972	14,029	17,452	17,572	18,298	18,634	18,652	20,808	21,877
	Total assets (th EUR)	4,806	4,550	5,155	5,541	5,337	5,098	5,012	5,382	5,511
	Nº of employees	14	16	17	18	17	17	17	18	20
	Turnover (th EUR)	2,541	2,402	3,020	3,420	3,259	3,002	3,215	3,240	3,647
	Total assets (th EUR)	1,429	8,259	9,815	12,361	17,571	21,689	23,454	27,113	31,960
	Nº of employees	9	55	55	59	64	72	75	80	89
	Turnover (th EUR)	447	1,090	3,329	4,612	5,500	7,363	8,715	12,423	13,641
	Total assets (th EUR)	16,706	7,917	8,264	11,065	9,830	10,477	8,782	8,792	11,594
	Nº of employees	NA	46	26	30	26	26	26	26	26
	Turnover (th EUR)	13,511	6,912	7,931	12,552	8,889	10,463	8,755	9,838	13,317
	Total assets (th EUR)	6,754	4,446	4,613	6,753	5,396	4,972	4,624	5,141	7,185
	Nº of employees	35	26	29	34	39	20	27	28	43
	Turnover (th EUR)	5,426	3,527	3,666	5,645	4,134	3,690	5,088	5,867	8,040
	Total assets (th EUR)	42,289	42,267	42,774	39,424	38,395	32,868	30,717	32,723	40,682
	Nº of employees	131	131	117	117	126	112	110	111	153
	Turnover (th EUR)	16,156	17,232	14,670	14,516	20,420	24,745	26,215	33,068	39,846
	Total assets (th EUR)	6,563	6,861	7,322	8,061	8,134	8,117	7,812	8,870	9,779
	Nº of employees	21	23	31	25	21	20	19	19	24
	Turnover (th EUR)	4,218	3,664	4,241	4,988	4,285	4,604	4,186	4,787	5,237
	Total assets (th EUR)	2,005	2,016	2,031	1,680	1,538	1,590	1,564	1,713	2,090
	Nº of employees	14	15	11	11	13	12	12	12	12
	Turnover (th EUR)	3,032	2,379	2,141	2,972	2,536	2,827	2,991	2,922	3,378
	Total assets (th EUR)	1,363	1,303	1,986	2,217	2,177	2,190	2,074	1,898	2,154
	Nº of employees	7	11	11	10	7	8	6	8	9
	Turnover (th EUR)	1,180	1,124	1,117	1,523	1,075	650	729	-216	2,466
	Total assets (th EUR)	12,146	11,846	13,203	14,361	14,737	15,768	17,335	18,388	20,837
	Nº of employees	28	29	31	30	31	32	35	36	42
	Turnover (th EUR)	4,867	5,297	6,594	7,511	7,883	8,679	11,366	12,128	15,003

5 The Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized companies states that small and medium-sized companies (SMEs) employ fewer than 250 employees and have an annual turnover not exceeding €50 million. In this sense, medium-sized companies labelled by Orbis (even some large companies) could include SMEs as stated by the European Commission. Aquaculture is not considered a labor-intensive activity, so given the difference of criteria, it has been decided to follow the classification provided by Orbis, which homogenises the EU countries.

3.2. Methodology

There are various types of indicators that can be used to measure company or industry performance (Engle, 2010; Misund, 2018; Misund and Nygard, 2018), which can be classified into production and input use efficiency, profitability, solvency, liquidity, financial efficiency, repayment capacity, and growth ratios. As stated by FAO (1999), the choice of indicators should be restricted to a limited number of effective indicators, based on aspects, such as, policy priorities, feasibility, data availability, or understandably, among others.

Considering the above and taking into account criteria of comparability, synthesis and availability of information, the main variables extracted from Orbis were: total assets, number of employees, equity, turnover, Earnings Before Interest and Tax (EBIT), total debts, and net profit. Total assets is the current amount of all gross investments, cash and equivalents, receivables, and other assets as they are presented on the balance sheet. The number of employees is the number of persons who work in the unit observed according to the information supplied by the company in their public balance declarations. Equity represents the own resources contributed by the owners of the company. The turnover comprises all market sales of goods and services supplied to third parties (Guillen et al., 2015). EBIT or "Operating profit" is a measure of the profitability that excludes interest and income tax expenses. It represents the profits obtained by the activity carried out, independently of how the investments have been financed, or of the taxation of the place where the company is located. Total debts are the sum of all non-current and current liabilities. Another measure of profitability is net profit, which represents the economic result after subtracting all the cost related with the activity. Usually, this indicator considers financial cost and taxes, so its result is affected by the financial strategy of the company and by the tax system.

Relative indicators to facilitate the comparison of the economic performance between different countries and company sizes is also calculated. EBIT margin provides an assessment of the profitability comparing the earnings with the revenues. The result indicates the proportion of the remaining revenues (earnings) after the operating expenses (Guillen et al., 2015). *EBIT margin = EBIT / Turnover*.

The most widespread indicators are the Return on Assets (ROA) and Return on Equity (ROE). The ROA is calculated dividing the EBIT by the total assets of the company. The result is the return obtained by the investments made, regardless of how they have been financed or of the taxation. This indicator allows knowing if the activity that the company is developing is profitable or not. *ROA = EBIT / Total assets*.

The ROE is calculated by dividing the net profit between the equity. In this way, it is obtained an indicator of the profitability that the owners obtain for the investment they have made. This performance measure is affected not only by the result of the productive and commercial activity of the company, but also by the financial structure and by taxation. *ROE = Net Profit / Equity*.

The financial structure of the companies in this industry is illustrated measured through the debt ratio, which shows the relevance of indebtedness. *Debt ratio = total debts / value of assets*.

4. Results

The average of economic performance indicators is shown in Table 5. Over the whole period 2008-2016, the evolution of the economic performance parameters, EBIT Margin, ROA and ROE, have been showing a positive trend, but with significant year-to-year variation. The year 2009 was particularly bad as all the performance parameters were negative. After another negative year in 2013, all the three indicators considered doubled or almost doubled from 2015 to 2016.[6]

[6] Such cycles are common in industries with biological production process in agriculture, and have been documented for salmon in aquaculture (Asche et al., 2018).

The margin generated by sales, as well as the return on assets, have followed a very similar positive trend. The results show that since 2009, except 2013, EBIT margin has been positive, taking off in 2013 until registering the best result of the series in the last year. This positive evolution is explained in part by the positive trend followed in general by seabream and seabass price until 2014, and by the significant increase in the quantities produced during 2015 and 2016. It is also likely that increases in production generate economies of scale, reducing the average cost of production, and increasing the EBIT margin. In addition, since 2013 the return on equity is higher than that of assets, which indicates a positive effect of the financial leverage on the ROE. However, ROE shows greater volatility throughout the period, which indicates a higher degree of uncertainty in companies' financial structures. It is also observed a decrease in the level of indebtedness in recent years, which is consistent with the results of other secondary data sources at aggregated level, such as STECF (2018)

Table 5. Economic performance indicators (companies' average) for the EU seabream and seabass companies. Source: Authors calculation based on data obtained from ORBIS.

	2008	2009	2010	2011	2012	2013	2014	2015	2016
EBIT Margin (%)	0.14	-0.37	0.61	0.69	1.93	-0.16	3.52	4.32	7.26
ROA (%)	-0.50[7]	-0.62	0.58	1.02	1.43	-2.63	1.76	2.96	6.33
ROE (%)	-6.36	-2.50	0.03	7.76	-17.02	2.97	20.31	8.67	17.28
Debt ratio (%)	72.04	70.90	71.91	71.88	71.52	76.66	79.33	78.52	70.29
Companies with negative net profit (%)	32.0	35.1	29.7	28.9	31.3	38.3	24.4	19.5	7.8

4.1. Profitability by country

Economic performance indicators of seabass and seabream companies by country are shown in Table 6. In most countries, the general trend in the industry is replicated, that is, obtaining positive economic returns since 2013, with a positive impact of the financial leverage on the ROE and greater volatility thereof. However, there are differences between countries that are worth mentioning. While the EBIT margin, ROA and ROE remain positive and have increased in Greece, Italy and Spain since 2013, French companies in the sample decreased all their profitability indicators in 2016, making it likely that French production will continue to decline.

Table 6. Economic performance indicators (companies' average) for the EU seabream and seabass companies by country. Source: Authors calculation based on data from ORBIS.

		2008	2009	2010	2011	2012	2013	2014	2015	2016
Croatia	EBIT Margin (%)	20.99	4.76	5.56	-15.16	4.85	6.07	12.37	13.85	12.50
	ROA (%)	8.21	5.45	2.60	-1.76	1.38	4.11	4.42	5.29	7.04
	ROE (%)	20.86	8.10	-50.39	84.94	-18.04	-37.03	43.93	34.12	21.87
Cyprus	EBIT Margin (%)	6.71	7.02	8.16	9.34	7.76	6.67	8.71	9.83	8.76
	ROA (%)	5.43	8.01	10.51	14.88	7.76	7.98	8.61	10.72	10.36
	ROE (%)	5.22	12.55	16.49	17.88	12.82	13.94	-3.39	-8.15	16.03
France	EBIT Margin (%)	-1.38	1.03	0.46	3.52	6.79	2.23	4.84	7.05	5.78
	ROA (%)	-1.60	0.59	1.14	3.03	5.18	1.11	6.08	9.33	7.64
	ROE (%)	0.79	2.67	-9.45	17.60	11.96	-1.96	13.06	14.26	2.40
Greece	EBIT Margin (%)	2.21	2.79	2.87	2.98	1.15	-3.70	2.61	5.65	10.19
	ROA (%)	-0.38	1.97	1.09	0.64	0.60	-5.27	-1.22	4.96	10.28
	ROE (%)	-18.25	-4.42	6.16	-7.41	-9.35	16.11	26.40	0.05	10.11
Italy	EBIT Margin (%)	8.53	6.65	3.50	2.26	1.88	-0.32	4.41	4.18	5.46
	ROA (%)	5.17	3.14	2.34	4.77	0.92	2.15	2.65	3.22	4.13
	ROE (%)	4.54	11.20	9.90	16.31	-32.46	-5.88	14.22	4.40	31.97
Portugal	EBIT Margin (%)	6.08	0.16	1.78	3.25	1.68	1.65	1.05	2.16	1.28
	ROA (%)	9.19	0.18	1.88	5.74	2.77	2.93	2.00	3.69	2.06
	ROE (%)	16.55	3.12	3.47	8.78	3.06	3.45	1.80	4.33	2.77
Slovenia	EBIT Margin (%)	-0.22	1.63	5.60	-0.19	-6.54	0.53	-25.75	NA	25.55

[7] Note. EBIT margin and ROA have the same nature (positive or negative) in a company or in aggregated data. The average calculation of those variables among several companies can lead to unexpected results when they are close to zero, so that EBIT margin can be positive and ROA can be negative or viceversa.

	ROA (%)	-2.49	1.79	4.39	-0.55	-1.16	-4.33	-2.37	NA	29.25
	ROE (%)	16.15	4.82	30.20	30.89	25.86	5.67	-4.00	NA	44.57
Spain	EBIT Margin (%)	-6.33	-7.95	-4.85	-1.49	1.99	1.74	3.56	-0.27	3.88
	ROA (%)	-3.29	-6.04	-1.93	-0.99	1.65	-4.35	2.80	1.36	2.43
	ROE (%)	-4.46	-9.94	-6.78	7.02	-8.80	-1.95	20.00	10.44	16.40

Unlike Spain and Italy, where in average terms, the return on equity is higher than that of assets, Greek companies still have a financial leverage that negatively affects the ROE. This result suggests that, although capital yields are positive, the financial structures of Greek companies reduce in part the economic performance obtained by the commercial activity. In the last year considered, such negative leverage was reduced, and during the period 2008-2016 both situations, positive and negative leverage have alternated. However, these results seem to indicate that, while the financial structure is a key aspect to understand the economic performance of the industry in recent years, it is especially so in the case of Greek companies.

4.2. Profitability by size

Three quarters of the sample are medium-sized companies (72.6%), followed by large (23.4%) and very large companies (3.9%). Very large companies in the sample are found in Spain, Greece and Cyprus.

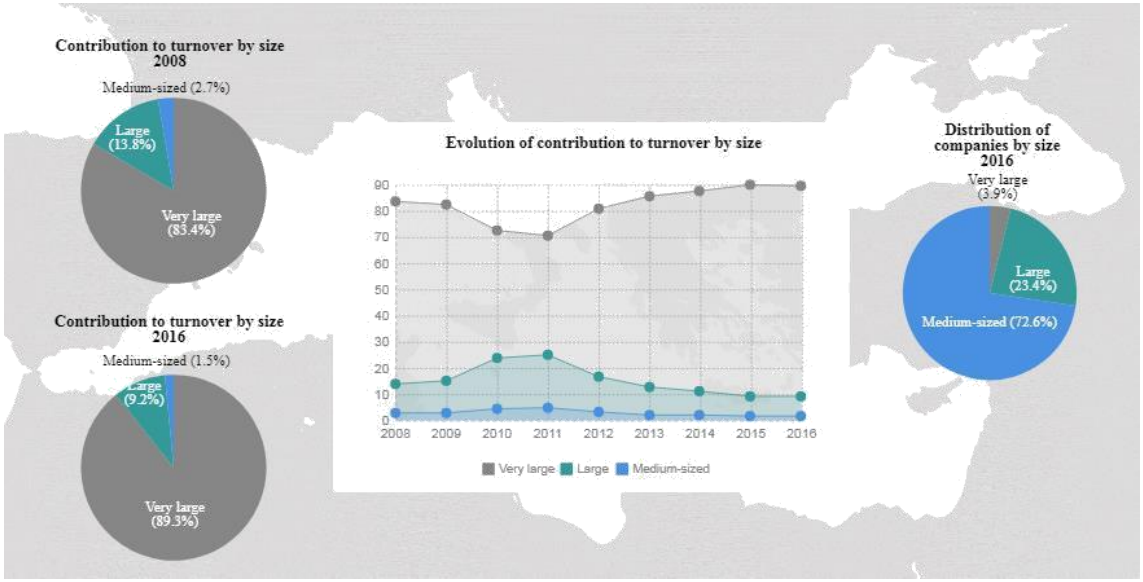
Table 7. Economic performance indicators (companies' average) for the EU seabream and seabass companies by company size. Source: Authors calculation from data obtained in ORBIS.

		2008	2009	2010	2011	2012	2013	2014	2015	2016
Very large	EBIT Margin (%)	-0.36	-3.83	5.01	-5.29	4.58	9.4	26.11	29.18	27.35
	ROA (%)	-3.21	-0.58	-3.84	-5.55	2.41	10.11	15.91	35.33	29.56
	ROE (%)	-54.34	-56.53	5.21	-27.61	-6.65	57.39	43.10	-66.91	14.04
Large	EBIT Margin (%)	0.3	-4.15	-4.45	-2.51	-2.34	-3.81	2.03	-0.18	3.61
	ROA (%)	-0.30	-1.12	-1.12	1.13	0.51	0.03	-0.70	3.80	5.82
	ROE (%)	-4.22	-16.55	-15.54	-6.70	8.36	16.32	-9.45	30.58	12.38
Medium-sized	EBIT Margin (%)	0.11	1.14	1.96	2.22	3.31	0.64	2.69	4.61	7.33
	ROA (%)	-0.39	-0.45	1.45	1.40	1.70	-4.45	1.63	0.59	4.84
	ROE (%)	-3.89	19.68	4.75	15.13	-17.48	-5.52	28.77	4.42	19.74

Table 7 shows the average of the economic performance indicators by size. The average of profitability is positive in all size classes in 2016, with an increasing trend since the 2008. Although, the very large companies have an absolute higher averages in 2016, the relative performance from 2015 to 2016 is better in large and medium sized companies. Returns obtained by investments are clearly higher in very large companies (average of 29.6%), followed by lower profitability in smaller companies. However, the ROE is higher in medium-sized companies (19.7%), followed by very large (14%) and large companies (12.4%). Very large companies are the only ones in which the financial leverage has a negative impact on the ROE. This can be explained by many factors, between them, the process of consolidation and horizontal integration of companies during the last years, which was financed mainly by loans. This led to higher degree of external capital within the large companies. In addition, financial problems in southern Europe raised the interest rates. This has specially impacted Greece, where the largest companies in the sector are located.

In spite of the fact that very large companies only cover 3.9% of the sample, these companies contributed with 83.4% of the total turnover in 2008, and the share has increased over time to reach 89.3% in 2016. In contrast, the contribution of large companies (23.4% of the sample) has declined from 13.8% in 2008 to 9.2% in 2016 (see Figure 3).

Figure 3. Evolution of contribution to turnover by size. Seabream and seabass companies in the EU. Source: Authors calculation based on data from ORBIS.



5. Discussion and conclusions

Seabream and seabass is the main finfish aquaculture industry in the Mediterranean and the second most important in the EU. The industry generated high expectations due to its rapid growth in the 1990s. However, the production of seabream and seabass decreased at the beginning of this century. Since then it has followed a positive growth trend, however, at a much slower pace, and with cycles in production and profitability. In spite of the technical development and larger scale of production, the operational cost per kilo produced has followed an increasing trend over time, mainly caused by the rise in the costs of feed, fingerlings and energy (STECF, 2018). This trend is different from what is experienced in the salmon (Asche, Guttormsen and Nielsen (2013a) and trout (Nielsen, Asche and Nielsen 2016) aquaculture industries. Different from other countries in the Mediterranean area such as Egypt, Tunisia and especially Turkey, the production in the EU has slowed its growth since 2010.

It is generally accepted that finfish aquaculture is frequently a cyclical industry with substantial price volatility (Dahl and Oglend, 2014; Asche et al, 2017). However, limited attention has been given to the economic performance of the companies in the industry with some recent exceptions for salmon (Asche, Sikveland and Zhang 2018; Misund and Nygård, 2018). Taking as a starting point the study in which Guillen et al. (2015) estimated the economic performance of the EU aquaculture sector, and considering as a reference the reports on the EU aquaculture economic provided by the STECF, this work has analyzed the profitability of seabream and seabass companies with an innovative approach based on company financial and accountancy data.

The economic performance of seabream and seabass companies was on average negative from 2008 to 2013. After this period in which both assets and equity obtained negative economic returns, companies returned to positive profitability. These results are consistent with those shown in the EU aquaculture sector reports (STECF, 2016, 2018). The causes of the improvement of profitability indicators can be very diverse. In spite of the continuous rise in the price of raw materials during the period analyzed, and the slower increase in the supply of seabream and seabass, the positive trend in the evolution of production value contributed to the improvement of the companies' economic results (MAPAMA, 2019; EUROSTAT, 2019). During 2015 and 2016, production increased. The greater demand of the markets absorbed the increases of production and this in turn kept prices stable (GLOBEFISH, 2017a). As a result, economic results continued to improve. Furthermore, the reduction in the number of companies and the process of horizontal integration into larger sized companies could have facilitated, as in the case of salmon industry (Asche et al., 2013b), the generation of economies of scale that reduced the average cost of production (Cidad et al., 2018), increase productivity or at least could have helped to reduce the impact of the increasing operational cost caused by the rise in input cost. Moreover, in some

countries such as Spain and Italy, the positive evolution of performance indicators can be also linked to a strong commitment to vertical integration towards processing and marketing activities that increase the added value generated by companies.

In relation to size, and as in the case of salmon (Asche et al., 2013b), there are studies that have investigated productivity growth and economies of scale at production facility level in seabream and seabass industry (Karagiannis et al., 2000a; Karagiannis et al., 2002; Hernandez et al., 2007; Pantzios et al., 2011). Relative decreasing production costs with respect to increasing facility size is commonly observed in the production of most commercial species (Gasca-Leyva et al., 2002). However, less attention has been given to company size, mainly due to the difficulty to obtain such data. The results of our analysis confirms the positive effects of a greater company size on the profitability of seabream and seabass companies. These results are in line with those obtained by Asche et al. (2013b), who showed how the increase in the company size and the concentration helped the salmon industry grow, providing advantages of scale not only in terms of production but also in other aspects such as the purchases of services or in marketing and sales. The comparison of profitability indicators by companies' size shows that very large companies obtain the highest returns on assets (ROA), followed by large companies and the medium-sized companies. On the contrary, very large companies do not have the higher return on equity (ROE) because they are the only ones with a financial leverage that negatively affects the return on equity. In an unstable financial context, as has happened in recent years, the most leveraged companies suffer to a greater extent the negative effects of a high degree of indebtedness, as has happened in the case of large Greek companies.

Although 2015 and 2016 confirmed the recovery of the profitability of companies in the sector, trade data in 2017 and 2018 showed increases in the exports of the main producers, which suggest that production continues to increase. Furthermore, export prices during 2017 indicated that the price of seabream and seabass began to adjust downward by the increased supply. This situation has sown uncertainty in the industry about possible new price drops due to further increases in production volumes (GLOBEFISH, 2017a). This is in particular the case for the largest producing country, Turkey, whose producers can better accommodated price decreases thanks to the sustained depreciation of the Turkish lira. The general context in which the industry faces the increase in production and the possible fall in prices is not the same as that of 2009 in terms of competitiveness. Companies have made efforts in innovation and improvements on production efficiency. Likewise, progress has been made in the development of new markets (Cidad et al., 2018).

Even with the positive evolution of economic results in recent years, the industry competitiveness has room for improvements. The economies of scale could have a limit and oversupply has shown to generate instability in the markets and to negatively impact the economic results in the medium-long term. The efforts to improve the EU industry competitiveness should help companies to increase their production efficiency through technical, operational and management innovations. The reduction of the average cost of production is a key aspect for the sustainability of the activity. The improvement of economic margins would make profitability less dependent on the volume of production, thus helping to avoid supply increases that result in price drops (Guillen et al., 2019). On the side of commercialization, the diversification of products and markets could help to reduce the risk associated with fluctuations in supply and prices, generating more stable companies' profitability. Hence, EU producers could consider new markets and differentiation as alternatives to price competition.

Despite the strong process of business concentration in the industry, there are still a large number of small-medium sized companies for which differentiation is a key aspect of their competitiveness. These companies are probably not relevant in terms of total production of the sector, but they are important from a socio-economic and environmental perspective for the coastal areas in which they carry out their activity. Their scale of production is not sufficiently

large to compete on price or diversify to a large number of markets or products (Avdelas et al., 2017; Cozzolino, 2017). Differentiation can be addressed in several ways, from the communication of the highest quality of the product, through the supply to local markets and restaurants, to innovation in processing and packaging. Sometimes, medium or small companies do not resort to differentiation or they fail due to lack of knowledge and resources necessary for example to carry out an effective communication strategy or to export to a third market. The reinforcement of the policies to support SMEs for transformation and commercialization, but especially for export to third countries where the product reaches a greater value, would be a way to increase the added value obtained by producers.

In the past, strategies based on price competition proved to generate a generalized fall in prices and a negative effect on the profitability of seabream and seabass companies. In spite of the problems suffered by the seabream and seabass industry, the good results obtained in recent years seem to have helped these two species to be together with salmon, the engine of the growth of the value of aquaculture in the EU. Unlike industries such as mussels, in which the companies' structure is more atomized and production is more exposed to the incidence of environmental factors, the evolution of the seabream and seabass industry towards larger companies seems to have contributed to the improvement of the economic results.

As indicated by Guillen et al., (2019), those policies whose objective was to increase production have shown not to have the expected results in terms of growth of the aquaculture sector in the EU. On the one hand, in general terms the strict environmental regulations and administrative burden in the EU limit the growth of production. On the other hand, more and more seabream and seabass imports are arriving at the EU at very competitive prices, which makes it inadvisable to promote strategies oriented towards production and price competition. Therefore, in order to sustain over time the recent improvements in the economic performance indicators, we recommend focusing on increasing the value of production instead of focusing on an increase in the quantities produced. At the same time continues effort to reduce cost and increase efficiency must be promote to sustain a positive development in the economic indicators. A positive development will also depend on the capacity of companies to increase the value of the production through improvements in product quality, product nutritional value, food safety, eco-friendly production, new products, differentiation strategies and the opening of new markets. In this course of action the vertical integration of seabream and seabass companies towards feed producers, processors and commercialization activities is another key aspect to sustain economic viability. The vertical integration can promote greater value for EU products by having control of the whole value chain, which enable companies to guarantee traceability with respect to the origin of feed, control of production, as well as control of slaughtering, cold chain and sale procedure.

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